

What is claimed is:

1. A method for assigning a cellular function to a component of a biochemical system, comprising:

5 (a) determining a multidimensional shape space for one or more components of a biochemical system in a reference state;

(b) perturbing a component within said biochemical system;

10 (c) determining a perturbed multidimensional shape space for one or more components of a pathway in said perturbed biochemical system, and

(d) identifying a multidimensional coordinate point corresponding to a component of said perturbed  
15 pathway altered between reference and perturbed multidimensional shape spaces, said identified component being assigned a cellular function of said perturbed pathway.

20 2. The method of claim 1, further comprising perturbing a second component of said perturbed pathway and determining a multidimensional coordinate point for said identified component, wherein an alteration in said multidimensional coordinate point for said identified  
25 component confirms the assignment of said identified component to said perturbed pathway.

3. The method of claim 1, wherein said biochemical system is selected from the group consisting  
30 of a cell, tissue, organism and subcellular system.

4. The method of claim 1, wherein said multidimensional shape space comprises multidimensional coordinate points representing expression data elements.

5           5. The method of claim 1, further comprising determining a multidimensional shape space for at least two perturbed pathways.

10           6. The method of claim 1, further comprising determining a multidimensional shape space for at three perturbed pathways

15           7. The method of claim 1, further comprising determining a multidimensional shape space for substantially all perturbed pathways of said biochemical system.

8. A method for assigning a cellular function to a component of a biochemical system, comprising:

(a) determining an integrated multidimensional data space for each of at least two networks in a  
5 reference state biochemical system;

(b) determining a multidimensional shape space for at least one network in a perturbed state biochemical system, and

(c) determining a component multidimensional  
10 coordinate point contained within a multidimensional shape space representing the difference between multidimensional data spaces of reference and perturbed states of said biochemical system, said component being linked to said network having perturbed multidimensional  
15 shape space, and thereby being assigned the cellular function of said network.

9. The method of claim 8, further comprising  
20 determining a multidimensional shape space for at least one pathway in a perturbed state biochemical system, and determining a component multidimensional coordinate point contained within a multidimensional shape space representing the difference between multidimensional data spaces of reference and perturbed states of said  
25 biochemical system, said component being linked to said pathway having perturbed multidimensional shape space, and thereby being assigned the cellular function of said pathway.

10. The method of claim 8, wherein said biochemical system is selected from the group consisting of a cell, tissue, organism and subcellular system.

5           11. The method of claim 8, wherein said multidimensional shape space comprises multidimensional coordinate points representing a data element selected from the group consisting of nucleic acid expression data element and polypeptide expression data element.

10           12. The method of claim 8, further comprising determining an integrated multidimensional shape space for at least three networks.

15           13. The method of claim 8, further comprising determining a multidimensional shape space for at least four networks.

20           14. The method of claim 8, further comprising determining a multidimensional shape space for substantially all networks of said biochemical system.

25           15. The method of claim 8, further comprising determining a multidimensional shape space for at least two networks in a perturbed state biochemical system.

16. A method for assigning a cellular function to a component of a biochemical system, comprising:

(a) comparing two integrated multidimensional data spaces of a biochemical system obtained in reference  
5 and perturbed states of a biochemical system, said integrated multidimensional data spaces comprising at least two networks, and

(b) determining a component multidimensional coordinate point contained within a multidimensional data  
10 space representing the difference between multidimensional data spaces of reference and perturbed states of said biochemical system, said component being linked to said network having said perturbed multidimensional shape space, and thereby being assigned  
15 a cellular function of said network.

17. The method of claim 16, further comprising determining two or more pathway components, each having multidimensional coordinate points altered between said  
20 reference and perturbed states of said biochemical system, and linking a component having multidimensional coordinate points altered between said reference and perturbed states to said pathway components, thereby assigning to said component a cellular function of said  
25 pathway.

18. The method of claim 16, wherein said biochemical system is selected from the group consisting of a cell, tissue, organism and subcellular system.

19. The method of claim 16, wherein said integrated multidimensional data spaces comprise at least three networks.

5           20. The method of claim 16, further comprising determining a multidimensional shape space for at least four networks.

10           21. The method of claim 16, further comprising determining a multidimensional shape space for substantially all networks of said biochemical system.

15           22. A method for assigning a cellular function to a component of a biochemical system, comprising:

(a) perturbing a component of a network in a reference biochemical system;

(b) determining a multidimensional coordinate point representing a data element of one or more components of a perturbed biochemical system;

20           (c) comparing said multidimensional coordinate point to a reference data element region, and

(d) determining if said multidimensional coordinate point is within or outside said reference data element region, wherein a multidimensional coordinate point outside of said reference data element region indicates that said component is linked to said perturbed biochemical network, and is thereby assigned a cellular function of said network.

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23. The method of claim 22, wherein said data element is a data element selected from the group consisting of nucleic acid expression element and polypeptide expression element.

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24. A method for assigning a cellular function to a component of a biochemical system, comprising:

(a) determining a multidimensional coordinate point representing a data element of a set of components in a biochemical network of a perturbed biochemical system;

(b) comparing said multidimensional coordinate point to a network-associated reference expression region of said set of components, and

(c) determining if said multidimensional coordinate point is outside of said network-associated reference expression region, wherein a multidimensional coordinate point outside of said network-associated reference expression region indicates a perturbed state of said network, said component being linked to said perturbed network and thereby being assigned a cellular function of said network.

25. The method of claim 24, wherein said biochemical system is selected from the group consisting of a cell, tissue, organism and subcellular system.

26. The method of claim 24, wherein said data element is an expression data element.

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27. The method of claim 24, wherein said reference expression region indicates a normal state of a biochemical system.

5           28. The method of claim 24, wherein said components of the biochemical network comprise nucleic acids.

10           29. The method of claim 24, wherein said components of the biochemical network comprise polypeptides.

30. A method for assigning a cellular function to a component of a biochemical system, comprising:

15           (a) determining a multidimensional coordinate point representing a data element of a set of components in a biochemical pathway of a perturbed biochemical system;

20           (b) comparing said multidimensional coordinate point to a pathway-associated reference expression region of said set of components, and

25           (c) determining if said multidimensional coordinate point is outside of said pathway-associated reference expression region, wherein a multidimensional coordinate point outside of said pathway-associated reference expression region indicates a perturbed state of said pathway, said component being linked to said perturbed pathway and thereby being assigned a cellular function of said pathway.



31. The method of claim 30, wherein said biochemical system is selected from the group consisting of a cell, tissue, organism and subcellular system.

5           32. The method of claim 30, wherein said data element is an expression data element.

10           33. The method of claim 30, wherein said reference expression region indicates a normal state of a biochemical system.

15           34. The method of claim 30, wherein said components of the biochemical network comprise nucleic acids.

            35. The method of claim 30, wherein said components of the biochemical network comprise polypeptides.

20           36. A method for identifying a component of a biochemical network, comprising:

            (a) determining an integrated multidimensional data space for a biochemical system comprising at least two networks;

25           (b) perturbing at least one component of a biochemical pathway, and

            (c) determining a multidimensional coordinate point for a candidate network component affected by said perturbing of the biochemical system, wherein a candidate component having an altered multidimensional coordinate point in response to said perturbation is identified as a  
30           component of said biochemical network.

37. The method of claim 36, wherein said biochemical system is selected from the group consisting of a cell, tissue, organism and subcellular system.

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38. The method of claim 36, further comprising determining an integrated multidimensional data space for a biochemical system comprising at least three networks.

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39. The method of claim 36, further comprising perturbing at least two components of a biochemical pathway.

40. The method of claim 36, wherein said multidimensional coordinate point for a candidate network component represents a data element selected from the group consisting of nucleic acid expression data element and protein expression data element.

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41. The method of claim 36, wherein said network further comprises two or more pathways.

11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99 100 101 102 103 104 105 106 107 108 109 110 111 112 113 114 115 116 117 118 119 120 121 122 123 124 125 126 127 128 129 130 131 132 133 134 135 136 137 138 139 140 141 142 143 144 145 146 147 148 149 150 151 152 153 154 155 156 157 158 159 160 161 162 163 164 165 166 167 168 169 170 171 172 173 174 175 176 177 178 179 180 181 182 183 184 185 186 187 188 189 190 191 192 193 194 195 196 197 198 199 200 201 202 203 204 205 206 207 208 209 210 211 212 213 214 215 216 217 218 219 220 221 222 223 224 225 226 227 228 229 230 231 232 233 234 235 236 237 238 239 240 241 242 243 244 245 246 247 248 249 250 251 252 253 254 255 256 257 258 259 260 261 262 263 264 265 266 267 268 269 270 271 272 273 274 275 276 277 278 279 280 281 282 283 284 285 286 287 288 289 290 291 292 293 294 295 296 297 298 299 300 301 302 303 304 305 306 307 308 309 310 311 312 313 314 315 316 317 318 319 320 321 322 323 324 325 326 327 328 329 330 331 332 333 334 335 336 337 338 339 340 341 342 343 344 345 346 347 348 349 350 351 352 353 354 355 356 357 358 359 360 361 362 363 364 365 366 367 368 369 370 371 372 373 374 375 376 377 378 379 380 381 382 383 384 385 386 387 388 389 390 391 392 393 394 395 396 397 398 399 400 401 402 403 404 405 406 407 408 409 410 411 412 413 414 415 416 417 418 419 420 421 422 423 424 425 426 427 428 429 430 431 432 433 434 435 436 437 438 439 440 441 442 443 444 445 446 447 448 449 450 451 452 453 454 455 456 457 458 459 460 461 462 463 464 465 466 467 468 469 470 471 472 473 474 475 476 477 478 479 480 481 482 483 484 485 486 487 488 489 490 491 492 493 494 495 496 497 498 499 500 501 502 503 504 505 506 507 508 509 510 511 512 513 514 515 516 517 518 519 520 521 522 523 524 525 526 527 528 529 530 531 532 533 534 535 536 537 538 539 540 541 542 543 544 545 546 547 548 549 550 551 552 553 554 555 556 557 558 559 560 561 562 563 564 565 566 567 568 569 570 571 572 573 574 575 576 577 578 579 580 581 582 583 584 585 586 587 588 589 590 591 592 593 594 595 596 597 598 599 600 601 602 603 604 605 606 607 608 609 610 611 612 613 614 615 616 617 618 619 620 621 622 623 624 625 626 627 628 629 630 631 632 633 634 635 636 637 638 639 640 641 642 643 644 645 646 647 648 649 650 651 652 653 654 655 656 657 658 659 660 661 662 663 664 665 666 667 668 669 670 671 672 673 674 675 676 677 678 679 680 681 682 683 684 685 686 687 688 689 690 691 692 693 694 695 696 697 698 699 700 701 702 703 704 705 706 707 708 709 710 711 712 713 714 715 716 717 718 719 720 721 722 723 724 725 726 727 728 729 730 731 732 733 734 735 736 737 738 739 740 741 742 743 744 745 746 747 748 749 750 751 752 753 754 755 756 757 758 759 760 761 762 763 764 765 766 767 768 769 770 771 772 773 774 775 776 777 778 779 780 781 782 783 784 785 786 787 788 789 790 791 792 793 794 795 796 797 798 799 800 801 802 803 804 805 806 807 808 809 810 811 812 813 814 815 816 817 818 819 820 821 822 823 824 825 826 827 828 829 830 831 832 833 834 835 836 837 838 839 840 841 842 843 844 845 846 847 848 849 850 851 852 853 854 855 856 857 858 859 860 861 862 863 864 865 866 867 868 869 870 871 872 873 874 875 876 877 878 879 880 881 882 883 884 885 886 887 888 889 890 891 892 893 894 895 896 897 898 899 900 901 902 903 904 905 906 907 908 909 910 911 912 913 914 915 916 917 918 919 920 921 922 923 924 925 926 927 928 929 930 931 932 933 934 935 936 937 938 939 940 941 942 943 944 945 946 947 948 949 950 951 952 953 954 955 956 957 958 959 960 961 962 963 964 965 966 967 968 969 970 971 972 973 974 975 976 977 978 979 980 981 982 983 984 985 986 987 988 989 990 991 992 993 994 995 996 997 998 999 1000

42. A method for identifying functionally interactive components of a biochemical network, comprising:

(a) determining a set of components of a biochemical system, each component linked to another by a common first data element;

(b) determining a set of components of a biochemical system linked by a common second data element, the second data element represented by a multidimensional coordinate point corresponding to each component, and

(c) integrating the set of components linked by a common first data element with the set of components linked by a common second data element represented by a multidimensional coordinate point corresponding to each component, to produce a network of functionally interactive components, each component within said network of functionally interactive components being characterized as linked by at least two data elements.

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43. The method of claim 42, wherein said biochemical system is selected from the group consisting of a cell, tissue, organism and subcellular system.

44. The method of claim 42, wherein said first data element is selected from the group consisting of physical interaction data element and polypeptide expression data element.

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45. The method of claim 42, wherein said second data element is selected from the group consisting of polypeptide expression data element and nucleic acid expression data element.

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46. The method of claim 42, wherein each component within said network of functionally interactive components being characterized as linked by at least three data elements.

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47. A method for identifying a compound that restores a biochemical system to a reference state, comprising:

15 (a) determining an integrated multidimensional data space for a reference state of a biochemical system;

(b) determining an integrated multidimensional data space for a perturbation state of a biochemical system;

20 (c) contacting a biochemical system exhibiting the perturbation state with a test compound;

(d) determining a multidimensional shape space for said biochemical system contacted with said test compound, and

25 (e) identifying a compound that restores at least two multidimensional coordinate points in said perturbed multidimensional data space to reference state conditions, said compound having the ability to restore a biochemical system to a reference state.

48. The method of claim 47, wherein said biochemical system is selected from the group consisting of a cell, tissue, organism and subcellular system.

5           49. The method of claim 47, wherein said perturbation state of a biochemical system is a pathological condition.

48. The method of claim 47, wherein said biochemical system is selected from the group consisting of a cell, tissue, organism and subcellular system.